



PATENT

Attorney Docket No. 14912.786

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application)

PATENT APPLICATION

Inventor(s): Stephen E. Savas)

Art Unit: 1763

Application No.: 10/053,138)

Examiner: Parviz Hassanzadeh

Filed: 01/18/2002)

Title: Pulsed Plasma Processing of Semiconductor
Substrates)**RECEIVED**
MAY 23 2003
GROUP 1700INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR §1.97Commissioner for Patents
Washington, D.C. 20231

Sir:

Listed on an attached Form PTO-1449 is information known to applicant(s). The references listed on Form PTO-1449 were cited in U.S. patent 6,253,704 of which the present application is a continuation and/or U.S. patent 5,983,828 of which U.S. patent 6,253,704 is a divisional. A copy of each listed publication and U.S. and foreign patent is available to the Examiner in parent application no. 09/398,553 now issued as U.S. patent 6,523,704 and/or application no. 08/727,209 now issued as U.S. patent 5,983,828. Applicant will supply a copy of any cited document(s) upon request by the Examiner.

Applicants respectfully request that the listed information be considered by the Examiner and be made of record in the above-identified application. If form PTO-1449 is enclosed, the Examiner is requested to initial and return it in accordance with MPEP §609.

This statement is not intended to represent that a search has been made or that the information cited in the statement is, or is considered to be, material to patentability as defined in §1.56.

☒ This statement qualifies under 37 CFR §1.97, subsection (b) because (check all that apply):

- ☒ (1) It is being filed within 3 months of the application filing date and is other than a continued prosecution application under § 1.53(d)
-- OR --
- ☐ (2) It is being filed within 3 months of entry of a national stage
-- OR --
- ☒ (3) It is being filed before the mail date of the first Office Action on the merits
-- OR --
- ☐ (4) It is being filed before the mailing of a first Office Action after the filing of a request for continued examination under § 1.114.

☐ 37 CFR §1.97(c). If this statement is being filed after the latest of: (1) three months beyond the filing date of a national application; (2) three months beyond the date of entry of the national stage as set forth in §1.491 in an international application; or (3) the mailing date of a first Office action on the merits, but before the mailing date of the earlier of a final office action under §1.113 or a notice of allowance under §1.311, then:

☐ a certification as specified in §1.97(e) is provided below; or

☐ a fee of \$180.00 as set forth in §1.17(p) is authorized below, enclosed, or included with the payment of other papers filed together with this statement.

☐ 37 CFR §1.97(d). If this statement is being filed after the mailing date of the earlier of a final office action under §1.113 or a notice of allowance under §1.311, but before payment of the issue fee, then:

A. a certification as specified in §1.97(e) is completed below; and

B. a petition under 37 CFR §1.97(d) requesting consideration of this statement is submitted herewith; and

C. a fee of \$130.00 as set forth in §1.17(i)(1) is authorized below, enclosed, or included with the payment of other papers filed together with this statement.

☒ *Fee Authorization.* The Commissioner is hereby authorized to charge the above-referenced fees of \$ 0 and charge any additional fees or credit any overpayment associated with this communication to Deposit Account No. 23-2415 (Docket No. 14912.786).

Respectfully submitted,

WILSON SONSINI GOODRICH & ROSATI

Dated: 5-20-03

By: 
Michael J. Murphy, Reg. No. 37,404

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Please type a plus sign (+) inside this box →



05-22-03

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1763

PTO/SB/21 (6-99)

Approved for use through 09/30/2000. OMB 0651-0031

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number

10/053,138

Filing Date

01/18/2002

First Named Inventor

Savas

Group/Art Unit

1763

Examiner Name

Parviz Hassanzadeh

Total Number of Pages in This Submission

1,086

Attorney Docket Number

14912.786

ENCLOSURES (check all that apply)

☐ Fee Transmittal Form

☐ Fee Attached

☐ Amendment / Response

☐ After Final

☐ Version with Markings Showing Changes

☐ Affidavits/declaration(s)

☐ Extension of Time Request

☒ Information Disclosure Statement

☐ Certified Copy of Priority Document(s)

☐ Response to Missing Parts/Incomplete Application

☐ Response to Missing Parts under 37 CFR 1.52 or 1.53

☐ Assignment Papers (for an Application)

☐ Drawing(s)

☐ Licensing-related Papers

☐ Petition Routing Slip (PTO/SB/69) and Accompanying Petition

☐ Petition to Convert to a Provisional Application

☐ Power of Attorney, Revocation Change of Correspondence Address

☐ Terminal Disclaimer

☐ Small Entity Statement

☐ Request for Refund

☐ After Allowance Communication to Group

☐ Appeal Communication to Board of Appeals and Interferences

☐ Appeal Communication to Group (Appeal Notice, Brief, Reply Brief)

☐ Proprietary Information

☐ Status Letter

☐ Additional Enclosure(s) (please identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY OR AGENT

Firm or Individual name

Michael J. Murphy, Reg. No. 37,404, WILSON SONSINI GOODRICH & ROSATI

Signature

[Handwritten Signature]

Date

5-20-03

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CERTIFICATE OF FACSIMILE TRANSMISSION MAILING

I hereby certify that this correspondence is being transmitted to the Commissioner for Patents, Washington, D.C.

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May 20, 2003

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INFORMATION DISCLOSURE CITATION PTO-1449			ATTY. DOCKET NO. 14912.786		SERIAL NO. 10/053,138		
			APPLICANT Stephen E. Savas				
			FILING DATE 01/18/2002		GROUP 1763		
U.S. PATENT DOCUMENTS							
EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE	
	5,571,366	11/1996	Ishii et al.	156	345		
	5,647,913	07/1992	Blalock	118	723I		
	5,558,722	09/1996	Okumura et al.	118	723I		
	5,556,521	09/1996	Ghanbari	204	192.37		
	5,449,432	09/1995	Hanaw	156	643.1		
	5,696,428	12/1997	Pasch	315	111.21		
	5,690,781	11/1997	Yoshida et al.	156	345		
	5,401,350	03/1995	Patrick et al.	156	345		
	6,068,784	05/2000	Collins et al.	118	723I		
FOREIGN PATENT DOCUMENTS							
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	408288272	11/1996	Japan	C23C	16/50	<input type="checkbox"/>	<input type="checkbox"/>
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	2240114A	07/1991	Great Britain	C23C	16/26	<input type="checkbox"/>	<input type="checkbox"/>
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)							
	R.W. Boswell et al., "Pulsed high rate plasma etching with variable Si/SiO ₂ selectivity and variable Si etch profiles," Appl. Phys. Lett. 47 (10), 15 Nov. 1985, pp. 1095-1097						
	J. Pope et al., "A Highly Selective Nitride to Oxide Etch to Reduce Single Bit Failures on Memory Products," Electrochemical Society Proceedings, Vol. 93-21, 1993, pp. 168-234						
	PCT International Search Report dated 07 MAR 1997 of corresponding PCT Application No.						
	PCT/US96/16138, references cited above.						
EXAMINER			DATE CONSIDERED				

EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.



SHEET 2 OF 9

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U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	5,811,022	09/22/1998	Savas et al.	216	68	11/15/1994
	5,534,231	07/09/1996	Savas	216	67	01/17/1995
	5,419,805	05/30/1995	Jolly	156	643.1	02/18/1994
	5,399,237	03/21/1995	Keswick et al.	156	643	01/27/1994
	5,362,358	11/08/1994	Yamagata et al.	156	643	05/14/1993
	5,354,417	10/11/1994	Cheung et al.	156	643	10/13/1993
	5,354,381	10/11/1994	Sheng	118	723	05/07/1993
	5,344,792	09/06/1994	Sandhu et al.	437	200	03/04/1993
	5,332,441	07/26/1994	Barnes et al.	118	723	10/31/1991

FOREIGN PATENT DOCUMENTS

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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

	T.H. Ahn et al., "Negative ion measurements and etching in a pulsed-power inductively coupled plasma in chlorine," Plasma Sources Sci. Technol. 5, p. 139 (1996).
	C. Charles et al., "Breakdown, steady-state, and decay regimes in pulsed oxygen helicon diffusion plasmas," J. Appl. Phys. 78, p. 766 (1995).
	C. Charles et al., "SiO ₂ deposition from oxygen/silane pulsed helicon diffusion plasma," Apply. Phys. Lett. 67, p. 40 (1995).
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	5,318,668	06/07/1994	Tamaki et al.	156	662	10/20/1992	
	5,318,664	06/07/1994	Saia et al.	156	643	11/14/1991	
	5,312,518	05/17/1994	Kadomura	156	662	05/29/1992	
	5,310,452	05/10/1994	Doki et al.	156	643	07/20/1992	
	5,289,010	02/22/1994	Shohet	250	492.21	12/08/1992	
	5,286,344	02/15/1994	Blalock et al.	156	657	06/15/1992	
	5,286,297	02/15/1994	Moslehi et al.	118	723 E	06/24/1992	
	5,284,549	02/08/1994	Barnes et al.	156	662	01/02/1992	
	5,259,924	11/09/1993	Mathews et al.	156	653	04/08/1992	
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)							
	X. Chen et al., "Pulse plasma polymerization of tetramethyltin: Nanoscale compositional control of film chemistry," Chem. Mater. 8, p. 1067 (1996).						
	K. Hashimoto et al., "Reduction of the charging damage from electron shading," 1996 1st International Symposium on Plasma Process-Induced Damage, Santa Clara, CA, May 13-14 (1996).						
	M.A. Lieberman et al., "Global models of pulse-power-modulated high density, low pressure discharges," Plasma Sources Sci. Technol. 5, p. 145 (1996).						
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U.S. PATENT DOCUMENTS						
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	5,242,538	09/07/1993	Hamrah et al.	156	643	01/29/1992
	5,234,529	08/10/1993	Johnson	156	345	10/10/1991
	5,231,057	07/27/1993	Doki et al.	437	225	08/20/1991
	5,227,331	07/13/1993	Westmoreland	437	174	02/10/1992
	5,219,485	06/15/1993	Wang et al.	252	79.3	10/17/1991
	5,217,567	06/08/1993	Cote et al.	156	643	02/27/1992
	5,201,994	04/13/1993	Nonaka et al.	156	643	11/17/1989
	5,188,704	02/23/1993	Babie et al.	156	643	05/09/1991
	5,160,408	11/03/1992	Long	156	656	04/27/1990

FOREIGN PATENT DOCUMENTS							
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)	
	Y. Lin et al., "Negative and positive ions from CF ₄ /O ₂ RF discharges in etching Si," Appl. Phys. Lett. 62, p. 675 (1992).
	M. Moisan et al., "Radio frequency or microwave plasma reactors? Factors determining the optimum frequency of operation," J. Vac. Sci. Technol. B9, p. 9 (1991).
	H. Ohtake et al., "Charge-free etching process using positive and negative ions in pulse-time modulated electron cyclotron resonance plasma with low frequency bias," Appl. Phys. Lett. 68, P.2416 (1996).

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SHEET 5 OF 9

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	APPLICANT Stephen E. Savas	
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U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	5,153,442	10/06/1992	Bovino et al.	250	551	01/03/1991
	5,112,435	05/12/1992	Wang et al.	156	643	11/29/1989
	5,108,542	04/28/1992	Lin	156	643	08/23/1990
	5,007,982	04/16/1991	Tsou	156	643	07/11/1988
	4,994,715	02/19/1991	Asmus et al.	315	111.71	07/21/1988
	4,933,300	06/12/1990	Koinuma et al.	437	110	02/12/1988
	4,985,112	01/15/1991	Egitto et al.	156	643	02/09/1987
	4,970,435	11/13/1990	Tanaka et al.	315	111.21	12/08/1988
	4,935,661	06/19/1990	Heinecke et al.	313	231.31	06/26/1986

FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

	L.J. Overzet et al., "Enhancement of the negative ion flux to surfaces from radio-frequency processing discharges," J. Appl. Phys. 66, p. 1622 (1989).
	L.J. Overzet, "Model for charge movement after the radio frequency excitation is extinguished," J. Vac. Sci. Technol. A11, p. 1114 (1993).
	L.J. Overzet et al., "Modeling and measurements of the negative ion flux from amplitude modulated rf discharges," J. Appl. Phys. 72, p. 5579 (1992).

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SHEET 6 OF 9

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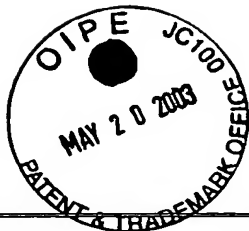
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	4,918,031	04/17/1990	Flamm et al.	437	225	12/28/1988
	4,897,365	01/30/1990	Baldi et al.	437	69	11/23/1987
	4,891,118	01/02/1990	Ooiwa et al.	204	298	11/23/1988
	4,863,549	09/05/1989	Grünwald	156	345	07/01/1988
	4,857,140	08/15/1989	Loewenstein	156	643	03/31/1988
	4,836,887	06/06/1989	Daubenspeck et al.	156	643	11/23/1987
	4,836,886	06/06/1989	Daubenspeck	156	643	11/23/1987
	4,824,690	04/25/1989	Heinecke et al.	427	38	11/03/1987
	4,807,016	02/21/1989	Douglas	357	67	11/20/1987

FOREIGN PATENT DOCUMENTS							
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)	
	L.J. Overzet et al., "Negative and positive ions from radio frequency plasmas in boron trichloride," Appl. Phys. Lett. 59, p. 161 (1991).
	L.J. Overzet et al., "Time-resolved power and impedance measurements of pulsed radio frequency discharges," Plasma Sources Sci. Technol. 4, p. 432 (1995).
	S. Samukawa, "Pulse-time-modulated electron cyclotron resonance plasma etching for highly selective, highly anisotropic, and notch-free polycrystalline silicon patterning," Appl. Phys. Lett. 64, p. 3398 (1994).

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SHEET 7 OF 9

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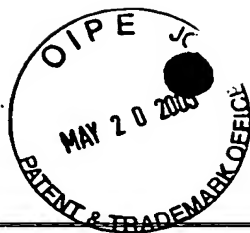
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	4,793,897	12/27/1988	Dunfield et al.	156	643	03/20/1987
	4,749,589	06/07/1988	Heinecke et al.	427	39	12/10/1985
	4,734,157	03/29/1988	Carbaugh et al.	156	643	03/18/1987
	4,717,447	01/05/1988	Dieleman et al.	156	643	10/31/1983
	4,693,805	09/15/1987	Quazi	204	192.22	02/14/1986
	4,654,114	03/31/1987	Kadomura	156	643	12/16/1985
	4,585,516	04/29/1986	Corn et al.	156	643	03/04/1985
	4,568,563	02/04/1986	Jackson et al.	427	40	06/21/1985
	4,263,088	04/21/1981	Gorin	156	626	06/25/1979

FOREIGN PATENT DOCUMENTS							
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	S. Samukawa, "Pulse time-modulated electron cyclotron resonance plasma etching with low radio-frequency substrate bias," Appl. Phys. Lett. 68, p. 316 (1996).
	S. Samukawa et al., "Time-modulated electron cyclotron resonance plasma discharge for controlling generation of reactive species," Appl. Phys. Lett. 63, p. 2044 (1993).
	S. Samukawa et al., "Pulse-time modulated electron cyclotron resonance plasma etching for highly selective, highly anisotropic, and notch-free polycrystalline silicon patterning," J. Vac. Sci. Technol. B12, p. 3300 (1994).

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U.S. PATENT DOCUMENTS							
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	4,180,432	12/25/1979	Clark	156	643	12/19/1977	
	4,075,583	02/21/1978	Kershaw	333	73 R	05/24/1976	
	3,940,506	02/24/1976	Heinecke	427	38	05/03/1974	
	4,568,410	02/04/1986	Thornquist	156	643	12/20/1984	
	4,412,119	10/25/1983	Komatsu et al.	219	121 PF	05/05/1981	
	4,401,507	08/30/1983	Engle	156	643	07/14/1982	
	4,283,249	08/11/1981	Ephrath	156	643	08/17/1979	
	5,983,828	11/1999	Savas	118	723I		
	4,500,563	02/19/1985	Ellenberger et al.	427/38	427/39		
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OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)							
	T. Shibayama et al., "Silicon etching by alternating irradiations of negative and positive ions," Plasma Sources Sci. Technol. 5, p. 254 (1996).						
	B.A. Smith et al., "Time-resolved energy distribution of F ⁻ from pulsed radio frequency discharges," J. Appl. Phys. Lett. 78, p. 5195 (1995).						
	H. Sugai et al., "Diagnostics and control of radicals in an inductively coupled etching reactor," J. Vac. Sci. Technol. A13, p. 887 (1995).						
EXAMINER				DATE CONSIDERED			

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INFORMATION DISCLOSURE CITATION PTO-1449		ATTY. DOCKET NO. 14912.786		SERIAL NO. 10/053,138			
		APPLICANT Stephen E. Savas					
		FILING DATE 01/18/2002		GROUP 1763			
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EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE	
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EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
						YES	NO
						<input type="checkbox"/>	<input type="checkbox"/>
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						<input type="checkbox"/>	<input type="checkbox"/>
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						<input type="checkbox"/>	<input type="checkbox"/>
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